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Comparison of cholecystectomy and percutaneous cholecystostomy in acute cholecystitis: results of a retrospective study

A. LA GRECA, M. DI GREZIA, S. MAGALINI, A. DI GIORGIO, C. LODOLI, G. DI FLUMERI, V. COZZA, G. PEPE, M. FOCO, M. BOSSOLA, D. GUI

Department of Emergency Surgery, University Hospital Foundation "Agostino Gemelli", Catholic University of the Sacred Heart, Rome, Italy

Abstract. – OBJECTIVE: To retrospectively compare the clinical outcomes of percutaneous cholecystostomy (PC) and cholecystectomy in patients with acute cholecystitis admitted to an urban University Hospital.

PATIENTS AND METHODS: We studied 646 patients with acute cholecystitis. Ninety patients had placement of a PC at their index hospitalization, and 556 underwent cholecystectomy. Of the 90 patients with PC, 13 underwent subsequent elective cholecystectomy.

RESULTS: Overall, in-hospital mortality and postoperative complications were significantly higher in patients who received PC than in those who underwent cholecystectomy. In the ASA score 1-2 group, patients with PC were significantly older and had a longer postoperative stay while their mortality and morbidity were similar to patients who underwent cholecystectomy. In patients with ASA score of 3, PC and cholecystectomy did not differ significantly for demographic variables and clinical outcomes such as hospital stay, in-hospital mortality, postoperative complications and distribution of complications according to the classification of Clavien-Dildo. In mild, moderate, and severe cholecystitis, patients who underwent PC were significantly older than those who received cholecystectomy. In general, in mild, moderate and severe cholecystitis, the clinical outcomes did not differ significantly between patients who received PC and cholecystectomy. Morbidity was higher in patients with mild cholecystitis who underwent PC. Of the 77 patients dismissed from the hospital with drainage, 12 (15.6%) developed biliary complications and 5 needed substitutions of the drainage itself.

CONCLUSIONS: PC does not offer advantages compared to cholecystectomy in the treatment of acute cholecystitis. Its routine use is therefore questioned. There is need of an adequate, randomized study that compares PC and cholecystectomy in high-risk patients with moderate-severe cholecystitis.

Key Words:
Cholecystitis, Cholecystostomy, Cholecystectomy, Percutaneous.

Introduction

Since 1980, percutaneous cholecystostomy (PC) has been proposed and used for the treatment of acute cholecystitis in patients with high surgical risk due to the severity of cholecystitis and/or the underlying acute or chronic medical comorbidities[1-21]. The drainage of the infected bile through the PC leads to a decrease of the inflammatory status and to an improvement of the clinical conditions. PC may be a definitive treatment or may represent a bridge to eventual delayed elective cholecystectomy.

Many studies[2-21] of single institutions have reported the short- and long-term results associated to the use of PC. A few studies[22-24] have compared PC and cholecystectomy in terms of in-hospital mortality, postoperative morbidity, and hospital stay, with conflicting results. Thus, it is still unclear if PC offers real advantages and if it should be considered the procedure of choice for the treatment of acute cholecystitis in high-risk surgical patients.

The aim of the present study is to compare the clinical outcomes of PC and cholecystectomy in patients with acute cholecystitis admitted to an urban university hospital.

Patients and Methods

Patients

The study was approved by the Institutional Ethical Committee. We retrospectively reviewed

Corresponding Author: Antonio La Greca, MD; e-mail: antonio.lagreca@policlinicogemelli.it

the records of all patients admitted for acute cholecystitis with the ICD-9CM codes 574 and 575 at the Department of Emergency Surgery of the Catholic University Hospital "Agostino Gemelli" of Rome, Italy from August 2009 to March 2016. Catholic University Hospital "Agostino Gemelli" is a 1500-bed urban medical center providing all levels of care.

Each record was reviewed for clinical history, physical examination, laboratory results, and radiological findings according to the Tokyo Criteria for diagnosis of acute cholecystitis. On the basis of these criteria, a diagnosis of acute cholecystitis is based on at least one local inflammation sign in the right quadrant (pain tenderness, mass, or positive Murphy sign) combined with at least one systemic sign of general inflammation (fever, elevated C-reactive protein level, increased white blood cell count). If acute cholecystitis was suspected, then an ultrasonography and/or CT-scan was performed. Patients with a definitive diagnosis of acute cholecystitis only were included in the present study. Of these, we recorded demographic characteristics (age, sex), ASA [American Society of Anesthesiology] score, Body Mass Index (BMI), type of treatment of acute cholecystitis (conservative medical therapy, cholecystectomy, PC), type of medical therapy, severity of acute cholecystitis (1 = mild, 2 = moderate; 3 = severe, according to Tokyo criteria), length of preoperative stay, length of postoperative stay, length of total hospital stay, laboratory parameters (alkaline phosphatase, ALT, AST, total bilirubin, white cell count). In-hospital mortality, post-operative complications, and complications according to the classification of Clavien-Dindo were also registered.

The decision to perform PC was made by the senior surgeon upon his/her discretion. PC placements were performed by an interventional radiologist under ultrasonographic or CT guidance. In general, a transabdominal approach was used. PC was performed under local anesthesia using a Seldinger guide wire technique. A small volume of contrast agent was injected, and fluoroscopy was used to confirm the position of the catheter.

Statistical Analysis

Statistical analysis was performed using the software SPSS 21.0 (SPSS Inc., Armonk, NY, USA). Continuous variables were expressed as mean±SD, and categorical variables displayed as frequencies. Differences between groups were assessed by chi-square (χ^2) of Fisher's exact test for categorical variables and by *t*-test or non-parametric Mann-Whitney test for continuous variables, as appropriate. $p < 0.05$ was considered statistically significant.

Results

We included 646 patients in the study. Their characteristics are shown in the Table I. Ninety patients had placement of a PC at their index hospitalization and 556 underwent cholecystectomy. Of the 90 patients with PC, 13 underwent subsequent elective cholecystectomy.

PC patients, with respect to patients who underwent cholecystectomy, were significantly older, had more frequently an ASA-3 score and a grade 3 cholecystitis, and had a higher prevalence of comorbidities. Overall, postoperative complications and in-hospital mortality were significantly higher in patients who received PC than in those who underwent cholecystectomy (Table I).

Then, we stratified patients according to the ASA score in two groups: ASA score 1-2 and ASA score 3. In the ASA score 1-2, patients with PC were significantly older and had a longer postoperative stay while their mortality and morbidity were similar to patients who underwent cholecystectomy (Table II). In patients with ASA-3 score, PC and cholecystectomy did not differ significantly for demographic variables and clinical outcomes such as hospital stay, in-hospital mortality, postoperative complications and distribution of complications according to the classification of Clavien-Dildo (Table III).

In mild, moderate, and severe cholecystitis, patients who underwent PC were significantly older than those who received cholecystectomy. In general, in mild (Table IV), moderate (Table V), and severe (Table VI) cholecystitis, the clinical outcomes did not differ significantly between patients who received PC and those who underwent cholecystectomy. Morbidity only was higher in patients with mild cholecystitis who underwent PC.

Of the 90 patients who underwent PC, 13 underwent cholecystectomy during the same in-hospital stay and 77 were dismissed from the hospital with drainage. Of these, 12 (15.6%) developed biliary complications (cholecystitis in 4, drainage dislodgement in 5, common bile duct stones in 3) and 5 (6.5%) needed drainage substitution. Only 31 patients decided to undergo elective, delayed cholecystectomy.

Table I. Comparison of patients affected by acute cholecystitis who underwent PC and cholecystectomy. Data are expressed as number (%) or mean ± SD.

	Percutaneous cholecystostomy (n. 90)	Cholecystectomy (n. 556)	p
Age (years)	78.3 ± 11.4	55.5 ± 17.6	< 0.0001
Sex			
Male	56 (62.2%)	268 (48.2%)	
Female	34 (37.8%	288 (51.8%)	0.754
ASA			
I	3 (3.3%)	276 (49.6%)	
II	28 (31.1%)	222 (39.9%)	
III	59 (65.6%)	58 (10.5%)	< 0.0001
Grade			
I	27 (30%)	305 (54.9%)	
II	34 (37.8%)	223 (40.1%)	
III	29 (32.2%)	28 (5%)	< 0.0001
Comorbidity			
Cardiovascular disease	78 (86.7%)	232 (41.7%)	< 0.0001
Diabetes mellitus	34 (37.8%)	47 (8.5%)	< 0.0001
COPD	24 (26.7%)	41 (7.4%)	< 0.0001
Cancer	19 (21.1%)	21 (3.8%)	< 0.0001
Liver disease	8 (8.9%)	14 (2.5%)	0.002
Renal disease	25 (27.8%)	20 (3.6%)	< 0.0001
Mortality	4 (4.4)	2 (0.3)	0.064
Morbidity	25 (27.7)	58 (10.4)	< 0.0001
Clavien 1	2 (2.2)	7 (1.2)	0.064
Clavien 2	16 (17.7)	28 (5.1)	< 0.0001
Clavien 3	4 (4.4)	13 (2.3)	0.277
Clavien 4	3 (3.3)	10 (1.8)	0.406

Discussion

The present study shows that cholecystectomy and PC, when patients are stratified for ASA score or for grade of cholecystitis, do not differ significantly in terms of in-hospital mortality. We also found that postoperative complications according to the classification of Clavien-Dindo and length of hospital stay are similar in the two groups of patients. In addition, the present study highlights that the burden of long-term complications following PC is high, affecting almost one/fourth of patients. These results question the advantage of the routine use of PC in high-risk patients affected by acute cholecystitis.

Table II. Comparison of patients who underwent PC and cholecystectomy: ASA 1-2 score. Data are expressed as number (%) or mean ± SD.

	Percutaneous cholecystostomy (n. 31)	Cholecystectomy (n. 498)	p
Age (years)	78.2 ± 12.8	54.8 ± 17.2	< 0.0001
Sex			
Male	20	230	
Female	11	268	0.062
Hospital stay (days)	6.4 ± 4.3	6.6 ± 5.4	0.839
Postoperative stay (days)	5.1 ± 3.7	3.6 ± 3.6	0.025
Mortality	0	1 (0.2)	1.000
Morbidity	5 (16.1)	43 8.6)	0.186
Clavien 1	0	6 (1.2)	1.000
Clavien 2	3 (9.6)	23 (4.6)	0.189
Clavien 3	2 (6.4)	10 (2)	0.152
Clavien 4	0	4 (0.8)	1.000

Table III. Comparison of patients who underwent PC and cholecystectomy: ASA3 score. Data are expressed as number (%) or mean ± SD.

	Percutaneous cholecystostomy (n. 59)	Cholecystectomy (n. 58)	p
Age (years)	78.4 ± 11.3	74.4 ± 11.6	0.061
Sex			
Male	36	38	
Female	23	20	1.000
Hospital stay (days)	11.8 ± 10.7	12.1 ± 10.7	0.879
Postoperative stay (days)	4.0 ± 2.4	4.2 ± 4.4	0.760
Mortality	4 (6.7)	1 (1.7)	0.366
Morbidity	20 (33.8)	15 (25.9)	0.420
Clavien 1	2 (3.4)	1 (1.7)	1.000
Clavien 2	13 (22.1)	5 (8.6)	0.070
Clavien 3	2 (3.4)	3 (5.2)	0.679
Clavien 4	3 (5.1)	6 (10.3)	0.321

Table IV. Comparison of patients who underwent PC and cholecystectomy: Grade I cholecystitis. Data are expressed as number (%) or mean ± SD.

	Percutaneous cholecystostomy (n. 27)	Cholecystectomy (n. 305)	p
Age (years)	78.6 ± 12.4	53.9 ± 17.8	< 0.0001
Sex			
Male	15	148	
Female	12	157	0.549
Hospital stay (days)	10 ± 12.7	6.3 ± 4.2	< 0.001
Postoperative stay (days)	8.3 ± 12.9	3.24 ± 2.3	0.0001
Mortality	0	1 (0.7)	1.000
Morbidity	6 (22.2)	21 (6.8)	0.014
Clavien 1	2 (7.4)	3 (0.9)	0.054
Clavien 2	3 (11.1)	8 (2.6)	0.051
Clavien 3	1 (3.7)	7 (2.3)	0.496
Clavien 4	0	3 (0.9)	1.000

Table V. Comparison of patients who underwent PC and cholecystectomy: Grade II cholecystitis. Data are expressed as number (%) or mean ± SD.

	Percutaneous cholecystostomy (n. 34)	Cholecystectomy (n. 223)	p
Age (years)	78.7 ± 9.8	59.23 ± 17.1	< 0.0001
Sex			
Male	18	110	
Female	16	113	0.716
Hospital stay (days)	6.7 ± 4.8	7.93 ± 8.1	0.401
Postoperative stay (days)	5.34 ± 4.2	4.58 ± 6.1	0.461
Mortality	1 (2.9)	1 (0.4)	0.247
Morbidity	6 (17.6)	32 (14.3)	0.104
Clavien 1	0	4 (1.8)	1.000
Clavien 2	6 (17.6)	16 (7.2)	0.014
Clavien 3	0	8 (3.6)	0.602
Clavien 4	0	4 (1.8)	1.000

The role of PC as a definitive treatment of high-risk patients affected by acute cholecystitis is still argument of debate. This is due to the fact that a few studies have compared PC and cholecystitis in terms of clinical outcomes[22-25]. Notably, a large multicenter study[22] has demonstrated that severely ill patients undergoing PC, compared with those who received laparoscopic cholecys-

Table VI. Comparison of patients who underwent PC and cholecystectomy: Grade III cholecystitis. Data are expressed as number (%) or mean ± SD.

	Percutaneous cholecystostomy (n. 29)	Cholecystectomy (n. 28)	p
Age (years)	79 ± 12.5	71 ± 12.9	0.020
Sex			
Male	23	16	
Female	6	12	0.091
Hospital stay (days)	12.9 ± 12.6	13.0 ± 8.3	0.972
Postoperative stay (days)	11.5 ± 12.9	7.77 ± 7.98	0.187
Mortality	3 (10.3)	0	0.236
Morbidity	13 (44.8)	5 (17.8)	0.177
Clavien 1	0	0	1.000
Clavien 2	7 (24.1)	2 (7.1)	0.144
Clavien 3	3 (10.3)	0	0.236
Clavien 4	3 (10.3)	3 (10.7)	1.000

tectomy, showed decrease morbidity, fewer intensive care unit admission, decreased length of stay and lower costs. However, three recent large studies[23-25] have demonstrated that PC is characterized by a worst outcome with respect to cholecystectomy. Anderson et al[23], who retrospectively studied the US Nationwide Inpatient Sample database, have shown that patients who received PC had increased odds of death and longer length of stay and a decreased complication rate compared with patients with cholecystectomy. Accordingly, the study cohort of Dimou et al[24] demonstrated that, in 8818 elderly patients hospitalized for grade III cholecystitis, PC was associated with higher 30- and 90-day mortality, longer length of hospital stay, and higher complication and readmission rates. In the study of Abi-Hadar et al[25], PC patients had longer intensive care unit stays, more complications, and higher readmission rates than patients who received cholecystectomy.

Notably, in the present study patients who underwent PC were significantly older than patients who received cholecystectomy. This suggests that the criteria used by the senior surgeons of our hospital for the indication to PC was the age of the patients, besides the ASA score and the grade of cholecystitis.

It seems that there is the urgent need of a prospective, randomized study that compares percutaneous PC and cholecystectomy in patients with high surgical risk and moderate to severe cholecystitis. Indeed, a randomized controlled trial has been recently designed to compare in high-risk patients with acute calculous cholecystitis, laparoscopic cholecystectomy, and percutaneous PC in terms of short- and long-term outcomes. Unfortunately, the results of this trial are not available yet[26]. Nevertheless, there is evidence of studies, in acute cholecystitis, comparing open and laparoscopic cholecystectomy as well as of studies on early laparoscopic cholecystectomy[27-31].

The present work has some limitations. First, it is a retrospective study, and this may have generated selection bias. Second, relatively small numbers in some subgroups may limit the interpretation of the results. Third, we did not evaluate the disease recurrence and the readmission rates associated with PC.

Conclusions

It seems that PC does not offer advantages compared to cholecystectomy in the treatment of acute cholecystitis. An adequate, randomized study that evaluates PC and cholecystectomy in high-risk patients with moderate-severe cholecystitis is needed.

Conflict of Interest

All authors finally approved the version to be published and agreed be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The Authors declare that they have no conflict of interests.

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